Work -Study

By: Mudit M. Saxena

Work - Study

'Work-study is a generic term for those techniques, method study and work measurement which are used in the examination of human work in all its contexts, and which lead systematically to the investigation of all the factors which affect the efficiency and economy of the situation being reviewyendit, M. istaren a Fed. @ Mect. Dag.



Work - Study

Work-study is encompassed by two techniques, i.e., method study and time measurement.

'Method study is the systematic recording and critical examination of existing and proposed ways of doing work, as a means of developing and applying easier and more effective methods and reducing costs.'

'Work measurement is the application of techniques designed to establish the time for a qualified worker to carry out a specified job at a defined level of performance."

Link between method study and work measurement

Method study is concerned with the reduction of the work content and establishing the one best way of doing the job.

where as **work measurement** is concerned with investigation and reduction of any ineffective time associated with the job and establishing time standards for an operation carried out as per the standard method.

IMPORTANCE OF WORK-STUDY

Work-study is a means of enhancing the production efficiency (productivity) of the firm by elimination of waste and unnecessary operations.

It is a technique to identify non-value adding operations by investigation of all the factors affecting the job.

It is the only accurate and systematic procedure oriented technique to establish time standards.

It is going to contribute to the profit as the savings will start immediately and continue throughout the life of the product.

It has got universal application.

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ADVANTAGES OF WORK-STUDY

It helps to achieve the smooth production flow with minimum interruptions.

It helps to reduce the cost of the product by eliminating waste and unnecessary operations.

Better worker-management relations.

Meets the delivery commitment.

Reduction in rejections and scrap and higher utilisation of resources of the organisation.

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ADVANTAGES OF WORK-STUDY

Helps to achieve better working conditions.

Better workplace layout.

Improves upon the existing process or methods and helps in standardization and simplification.

Helps to establish the standard time for an operation or job which has got application in manpower planning, production planning. 7

STUDY PROCEDUR

Mork-study is a procedure oriented and systematic study to establish the one best way (standard) method of doing a n operation b V investigation and analysis of all the details regarding the job or operation carried out as per the established By: Mudit M. Saxena, Dept. of Mech. Engg.

standard method



Work – Study **Work Simplification**

The work simplification starts with the analysis of the product and a detailed evaluation with regards to whether it can be changed in such a way as to make it easier to produce by reducing the waste, eliminating non-value adding operations, design modification, etc.

Thus work-study is a powerful tool to make work simplification. 9

Work - Study HUMAN CONSIDERATIONS

Work-study will become the powerful management tool to improve productivity only if a good relationship is established between the managers, supervisors, employees (workers).

Due considerations should be given to everyone concerned as an individual, and should see that no one will perceive a threat to his security and selfrespect.

Thus it is essential to consider the relationship between work-study and workers, supervisors and the management as work-study is a participative tool for investigation of the work being performed.

Work - Study work-study and the management

The management should create a climate of mutual trust and confidence in which every individual should feel to contribute positively towards the improvement.

Thus work-study being worker centred, due considerations should be given to their needs, motivation and problems to get maximum benefit out of this technique.

Thus management can gain a lot from workstudy if it is able to convince the workers and unions regarding objectives of this study and there should a free and open communication between the management and employees to get maximum benefit out of work-study.

Work - Study work-study and supervisor

Foreman is a manager on the shop floor to workers and the success of work-study in all its phases depends on him as it is he who is going to cooperate with the work-study man.

Before the work-study begins, the whole purpose of work-study and the procedures involved in the work-study must be carefully explained to the foreman so that he understands exactly what is being done.

This facilitates the work of work-study man as he is going to convey and convince the workers regarding the purpose and benefits of work-study. Thus the work-study man has to establish trust and friendship and sell his idea to get the acceptability coffethereforeman.

Work - Study WORK-STUDY AND THE WORKERS

Work-study brings about the improvements through changes in the methods, procedures and also some habits.

This change, the workers always perceive it as a threat to their job security and their familiarity. Any change is always resisted by human beings as there is lot of uncertainty (probability) is associated. Thus the management and the work-study man should be able to gain the acceptability and confidence of the workers by making them understand the need for the change and how this change is going to benefit both the workers and their organisation.

Now, the workers attitude towards work is changing fast; workers no more tolerate boredom and monotony on the work.

Because of longer years of education and exposure, they want to be master of their own and wants to take decision concerning their work by themselves.

So a greater responsibility now rests on the management to constructively channelize their efforts into constructive outlets

Work-Study MAN

Some qualities and qualifications expected from workstudy man.

Exposure and experience to the various production systems. A good knowledge of methods and systems of work-study. Objective approach to shop-floor problems.

- A strong believer of improvement of work methods through work-study.
- Mentally suited to the work.

Personal Qualities

Sincerity and honesty. Enthusiasm. Interest in and sympathy with people. Good appearance and self-confidence. Tact in dealing with people.

Work - Study

INFLUENCE OF METHOD AND TIME STUDY ON PRODUCTION ACTIVITIES



INFLUENCE OF METHOD AND TIME STUDY ON PRODUCTION ACTIVITIES

The basic objective of production management is to manufacture the right quantity and quality of goods at the predetermined time and pre-established cost.

Work-study is tool to achieve this objective. During the product design and process design, the methods of manufacture are fixed and process planning is done using the standard times and standard method.

Methods analysis guide with respect to how the work is to be best accomplished and time standards indicate how long will it take to

INFLUENCE OF METHOD AND TIME STUDY ON PRODUCTION ACTIVITIES

Process analysis and standard times, helps to have a control on quality and quantity manufactured. Based upon the standard times, standard cost are determined and this helps the analysis of variance between actual and standard costs.

Product cost which is a function of method and standard time and cost control is very much essential to be in competition.

Standard time form the basis for compensation. This helps to link wages and the work content. Thus work-study applied in right spirit helps to accomplish the production objectives.

Work – Study CONCEPT OF WORK CONTENT

The amount of work contained in a given job is referred to as work content. For a given job work content is measured in terms of man-hours or machine-hours.

Work content has two constituents:

Basic work content: Which is the minimum time theoretically required to do an operation or job. This cannot be reduced. Basic work content will result in the following conditions:

- The design and the specification are perfect.
- Process of manufacture is exactly followed.
- No loss of working time due to any of the reasons.

Thus, the basic work content represents an ideal condition which is not possible to achieve.

Excess work content: The actual time required to complete an operation or job is more than the basic time in practical situations. This additional portion of the work content is called excess work content.

Work - Study REASON FOR EXCESS WORK CONTENT

In a manufacturing company, the excess work content gets added because of the following:

Work content added due to defects in design or specification of a product

Typical causes under this classification are

- Bad design of the product.
- Lack of standardisation of components.
- Incorrect specifications and quality standards.
- Faulty design of components.

Work content added due to inefficient methods of manufacture

- Improper selection of a manufacturing process/machine.
- Wrong selection of tools.
- Lack of process standardisation.
- Improper layout of the shop/factory.
- Inefficient methods of material handling.

Work – Study REASON FOR EXCESS WORK CONTENT

Ineffective time added due to shortcomings of the management

- Bad working conditions.
- Frequent production interruptions due to breakdowns.
- Poor production planning and control.
- Lack of safety measures.
- Lack of quality mindedness.
- Improper communication (lack of instructions).,
- Frequent changes in set-ups (smaller lot size).
- Lack of performance standards.
- Shortage of materials/tools.

Ineffective time added due to reasons attributed to work man

- > Un-authorised absence from work.
- > Substandard performance.
- > Carelessness in working.
- > Un necessary wastage. of time (Idleness).

Work - Study REASON FOR EXCESS WORK CONTENT



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Work – Study TECHNIQUES TO REDUCE WORK CONTENT

1. Management techniques to reduce work content due to product

- > Product development.
- > Standardisation (variety reduction)
- > Value analysis.
- > Market research/consumer research.

2. Management techniques to reduce work content due to process or methods

- > Process planning.
- > Methods study.

Work – Study TECHNIQUES TO REDUCE WORK CONTENT

3. Management techniques to reduce ineffective time due to management

- > Product standardization and simplification.
- > Product specialization
- > Standardization of component.
- > Production planning and control.
- > Materials control.
- > Plant maintenance.
- > Safety measures and improved working condition.

4. Management techniques to reduce ineffective time within control. of the workers

- > Sound personnel policies.
- > Operators training.
- > Safety training.
- > Financial incentives.

WORK-STUDY AS A TOOL TO IMPROVE PRODUCTIVITY

The important functions of production management are setting up the most effective method of performing the operation (standard method) and control or effective utilisation of resources.

Work-study which comprises of method study and work measurement will fulfil these two requirements.

Method study aims at determining the most effective method of performing the job, the most logical layout for manufacturing facilities, uninterrupted flow of materials throughout the organisation, will help to complete the job in the least possible time and at optimum cost.

Work measurement on the other hand determine the time required by an operator to complete the operation or job for the standard method at the defined level of performance.

Work-study is the most effective tool to enhance productivity because of the fact that:

It is a straight-forward way of increasing the productive efficiency of the organisation.

Considers all the factors influencing productivity.

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Method study INTRODUCTION

Method study enables the industrial engineer to subject each operation to systematic analysis. The main purpose of method study is to eliminate the unnecessary operations and to achieve the best method of performing the operation.

Method study is also called methods engineering or work design. Method engineering is used to describe collection of analysis techniques which focus on improving the effectiveness of man and machines.

According to British Standards Institution (BS 3138):

"Method study is the systematic recording and critical examination of existing and proposed ways of doing work as a means of developing and applying easier and more **effective methods and reducing cost.**"

Fundamentally method study involves the breakdown of an operation or procedure into its component elements and their systematic analysis.

Method study

Required qualities of a method study person

- In carrying out the method study, the right attitude of mind is important. The method study man should have:
- The desire and determination and ability to produce results.
- An understanding of the human factors involved.

Scope of method study:

Method study scope lies in improving work methods through process and operation analysis, Such as;

- Manufacturing operations and their sequence. Workmen.
- Materials, tools and gauges.
- Layout of physical facilities and work station design.
- Movement of men and material handling. 26 Work environment

Method study

OBJECTIVES OF METHOD STUDY

Method study is essentially concerned with finding better ways of doing things. It adds value and increases the efficiency by eliminating unnecessary operations, avoidable delays and other forms of waste.

The improvement in efficiency is achieved through:

Improved layout and design of workplace.Improved and efficient work procedures.Effective utilisation of men, machines and materials.Improved design or specification of the final product.

The objectives of method study techniques are:

(1) To present and analyse true facts concerning the situation.
(ii) To examine those facts critically.
(iii) To develop the best answer possible under given

(ill) To develop the best answer possible under given circumstances based on critical examina-tion of facts.

SCOPE OF METHOD STUDY

The scope of method study is not restricted to only manufacturing industries. Method study techniques can be applied effectively in service sector as well. It can be applied in offices, hospitals, banks and other service organisations.

The areas to which method study can be applied successfully in manufacturing are:

- To improve work methods and procedures.
- To determine the best sequence of doing work.
- To smoothen material flow with minimum of back tracking and to improve layout.
- To improve the working conditions and hence to improve labour efficiency.
- To reduce monotony in the work.
- To improve plant utilisation and material utilisation.
- Elimination of waste and unproductive operations.

To reduce the manufacturing costs through reducing cycle time of operations.

STEPS INVOLVED IN METHOD STUDY

SELECT :	The job to be analyzed.
RECORD :	All relevant facts about present method.
EXAMINE	: The recorded facts critically.
DEVELOP :	The most efficient, practical and economic method.
DEFINE :	The new method.
INSTALL : practice.	The method as a standard
MAINTAIN:	That standard practice.

SELECTION OF THE JOB FOR METHOD STUDY

Cost is the main criteria for selection of a job, process, department for methods analysis.

To carry out the method study, a job is selected such that the proposed method achieve one or more of the following results:

Improvement in quality with lesser scrap. Increased production through better utilization of resources. Elimination of unnecessary operations and movements. Improved layout leading to smooth flow of material and a balanced production line. Improved working conditions.

SELECTION OF THE JOB FOR METHOD STUDY

The job should be selected for the method study based upon the following considerations:

- > 1. Economic aspect,
- > 2. Technical aspect, and
- > 3. Human aspect.

1. Economic Aspects

The method study involves cost and time: If sufficient returns are not attained, the whole exercise will go waste. Thus the money spent should be justified by the savings front it.

The following guidelines can be used for selecting a job Bottleneck operations which are holding up other production operations. Operations involving excessive labor. Operations producing lot of scrap or defectives. Operations having poor utilization of resources. Backtracking of materials and excessive movement of materials.

SELECTION OF THE JOB FOR METHOD STUDY

Technical Aspects:

The method study man should be careful enough to select a job in which he has the technical knowledge and expertise. A person selecting a job in his area of expertise is going to do full justice.

Other factors which favour selection in technical aspect are:

- > Job having in consistent quality.
- > Operations generating lot of scraps.
- > Frequent complaints from workers regarding the job.

Human Considerations:

Method study means a change as it is going to affect the way in which the job is done presently and is not fully accepted by workman and the union. Human consideration play a vital role in method study.

These are some of the situations where human aspect should be given due importance:

- > Workers complaining about unnecessary and tiring work.
- > More frequency of accidents.
- Inconsistent earnings.

Recording

The next step in basic procedure, after selecting the work to be studied is to record all facts relating to the existing method.

In order that the activities selected for investigation may be visualized in their entirety and in order to improve them through subsequent critical examination, it is essential to have some means of placing on record all the necessary facts about the existing method.

Records are very much useful to make before and after comparison to assess the effectiveness of the proposed improved method.

The recording techniques are designed to simplify and standardize the recording work.

Recording

Graphical method of recording was originated by Gilberth.

In order to make the presentation of the facts clearly, without any ambiguity and to enable to grasp them quickly and clearly, it is useful to use symbols instead of written description.

Symbols for recording

Operation

An operation occurs when an object is intentionally changed in one or more of its characteristics (physical or chemical). This indicates the main steps in a process, method or procedure.

An operation always takes the object one stage ahead towards completion.

Examples of operation are:

- Turning, drilling, milling, etc.
- A chemical reaction.
- Welding, brazing and riveting.
- Lifting, loading, unloading.
- Getting instructions from supervisor.
- Taking dictation.



Symbols for recording

Inspection

An inspection occurs when an object is examined and compared with standard for quality and quantity. The inspection examples are:

Visual observations for finish.

Count of quantity of incoming material.

Checking the dimensions.

Transportation

A transport indicates the movement of workers, materials or equipment from one place to another.

Movement of materials from one work station to another.

Workers travelling to bring tools.

Delay D

Delay (Temporary Storage)

A delay occurs when the immediate performance of the next planned thing does not take place. ; Ex:Work waiting between consecutive operations.

Workers waiting at tool cribs.

Operators waiting for instructions from supervisor.

Storage Q

A storage occurs when the object is kept in an authorised custody and is protected against unauthorised removal. For example, materials kept in stores to be distributed to various work centres.

MICROMOTION STUDY

• It is a technique for recording and timing an activity.

It consists of taking motion pictures of the operation with a clock in the picture (or with a video camera running at a known speed.The film is a permanent record of the method and the time and is always ready to be examined when needed.

Purposes of Micromotion Study

- 1. To assist in finding the preferred method of doing the work.
- 2. To assist in training the workers to understand the meaning of motion study and to enable them to apply motion economy principles in a professional way. 37

Micromotion study as an Aid in Improving Methods

Micro-motion study as an Aid in Improving Methods:

The procedure of making a micromotion study consists of :

- 1. Filming the operation to be studied.
- 2. Analysing the film.
- 3. Charting the results of the analysis.
- 4. Developing the improved method.

The speed of the camera used ranges from 960 to 1000 frames per minute. But faster cameras may be used to study very fast hand motions or complex operations.

The pictures should be enlarged many times to facilitate the analysis of the motions.

Micromotion study should be used when it is economical to do so (short cycle highly repetitive operations, large volume production, or operation performed by a large number of workers).

Micro-motion study

The micro-motion group of technique is based on the idea of dividing human activities into divisions of movements or group of movements (therbligs) according to purpose for which they are made.

Micro-motion study involves the following steps.

1. Filming the operations to be studied.

2. Analysis of data from the films:

Film is run at very low speed and is usually stopped or reversed frequently to identify the motions(therbligs)

3. Recording of data is done using SIMO chart. By: Mudit M. Saxena, Dept. of Mech. Engg.

SIMO CHART (Simultaneous motion cycle

chart)

It is a recording technique for micro motion study.

It is a chart based on film analysis used to record simultaneously on a common time scale the therbligs or a group of therbligs performed by different parts of the body of one or more operators.

It is the micro-motion form of man type flow process chart.

Micro motion Study

Micro motion Study

Dept..... Film No.....

Analysis Sheet

Operation: Finish hand fillings

Charted By.....

Date.....

Operator.....

S.No.	Left hand description	Therblig	Time	Therblig	Right hand
1.	Searching and lifting	SH,H	0.2		
2.			0.4	U	Opening the vice
З.	Clamping workpiece	PP	0.8	PP	clamping work piece in the vice piece in the vice.
4.			1.0	TL	Take the file
5.	Do the hand filling operation.	U	2.0	U	Do the hand filing Operation.
6.			2.2	TL	Taking the micrometer
7.	Check the dimension	1	3.0	1	Check the dimension
8.			3.2	U U	Open the vice
9.	Remove the work piece	TL	1000	3.4	the first and an and

Fig. 4.12.

Construction of "SIMO" Chart:

The SIMO chart for left hand and right hand analysis sheet inform about the degree of participation of both the hands.

The time for each Therblig recorded on the analysis sheet may be shown to scale by means of a SIMO chart.

Either the SIMO chart may be prepared independently or the chart may be constructed from the data available on the analysis sheet rog. 42

SIMO CHART

SIMO CHART (Corresponding to Fig. 4.12)

S.No.	Left hand description	Therblig	Time	Therblig	Right hand
1.	Searching and lifting work piece.	SH, H	400		
2.			400	U	Opening the vice
З.	Clamping work piece in vice	PP	800	PP	Clamping work piece in the vice
4.			400	TL	Take the file.
5.	Do the hand filling operation.	U	2000	U	Do the hand filling Operation.
6.	999 * (999,998,999,999,999)		400	TL	Taking the micrometer
7. 8.	Check the dimension	1	1600 400	I U	Check the dimension Open the vice
9.	Remove the work piece	TL	400		

Therbligs refer to primarily the motions of human body at the workplace and to the mental activities associated with it.

Therbligs are 18 kinds of elemental motions used in the study of motion economy in the workplace.

A workplace task is analyzed by recording each of the therblig units for a process, with the results used for optimization of manual labor by eliminating unneeded movements 44 By: Mudit M. Saxena, Dept. of Mech. Engg.

A **basic motion element** is one of a set of fundamental motions required for a worker to perform a manual operation or task. The set consists of 18 elements, each describing a standardized activity.

Transport empty [unloaded] (TE): reaching for an object with an empty hand. (Now called "Reach")

Group (G): grasping an object with the active hand.

Transport loaded (TL):moving an object using a hand motion.

Hold (H): holding an object.

Release load (RL): releasing control of an object.

Preposition (PP): positioning and/or orienting an object for the next operation and relative to an approximation location.

Position (P): positioning and/or orienting an object in the defined location.

Use (U): manipulating a tool in the intended way during the course working.
Assemble (A): joining two parts together.
Disassemble (DA): separating multiple components that were joined.

Search (Sh): attempting to find an object using the eyes and hands.

Select (St): choosing among several objects in a group.

Plan (Pn): deciding on a course of action.

Inspect (I): determining the quality or the characteristics of an object using the eyes and/or other senses.

Unavoidable delay (UD): waiting due to factors beyond the worker's control and included in the work cycle.

Avoidable delay (AD): waiting within the worker's control which causes idleness that is not included in the regular work cycle.

Rest in peace (R): resting to overcome a fatigue, consisting of a pause in the motions of the hands and/or body during the work cycles or between them.

Find (F): A momentary mental reaction at the end of the Search cycle. Seldom used.

-			
0	SEARCH		INSPECT
₿	FIND	å	PRE-POSITION
\rightarrow	SELECT	ð	RELEASE LOAD
\cap	GRASP)	EMPTY
9	TRANSPORT LOADED	¢ر	REST FOR OVER COMING FATIGUE
9	POSITION	0	UNAVOIDABLE DELAY
#	ASSEMBLE	ڡ	
U	USE	2	PLAN
Ħ	DISASSEMBLE		

Memomotion Study

In memomotion study, the camera speed is at 60 or 100 frames per minute.

In addition to its use in industrial operations, it is used to study many other operations such as check-in operations as airline counters, the manner in which customers select items in the store, traffic flow on highways, and in banks.

It costs less than micromotion study (only costs 6 % of the cost of a micromotion study)

RECORDING TECHNIQUES

According to the nature of the job being studied and the purpose for which the record is required the techniques fall into following categories:

1. Charts:

 Operation process chart, Flow process chart (Man, Material), Two hand process chart, Multiple activity chart

2. Diagrams:

Flow diagrams, string diagrams
 3. Templates and models.

Assignment

- Q 1. Define work study. What are the components of work study?
- Q 2. Explain the work study procedure.
- Q 3. What constitutes excess work content ? What are the techniques to reduce work contents.
- Q 4. Work study is powerful tool for improving productivity.
- Q 5. Write short notes on:
 - (i) Work study and management
 - (ii) Work study and workers
 - (iii) Work study and supervisors

Assignment

- Q 6. Define method study. What are its objectives ?
- Q 7. What are the steps involved in method study ?
- Q 8. How is job selected for method study ?
- Q 9. Explain the procedure for method study.
- Q 10. Make and explain various symbols for recording.
- Q 11. What are therbligs ? When it is used ? Give any five therbligs with symbols.
- Q 12. Make therbligs for following symbols:(a) Find (b) Grasp (c) Trnasport loaded(d) Hold (e) rest (d) Unavoidable delay